lesson 2

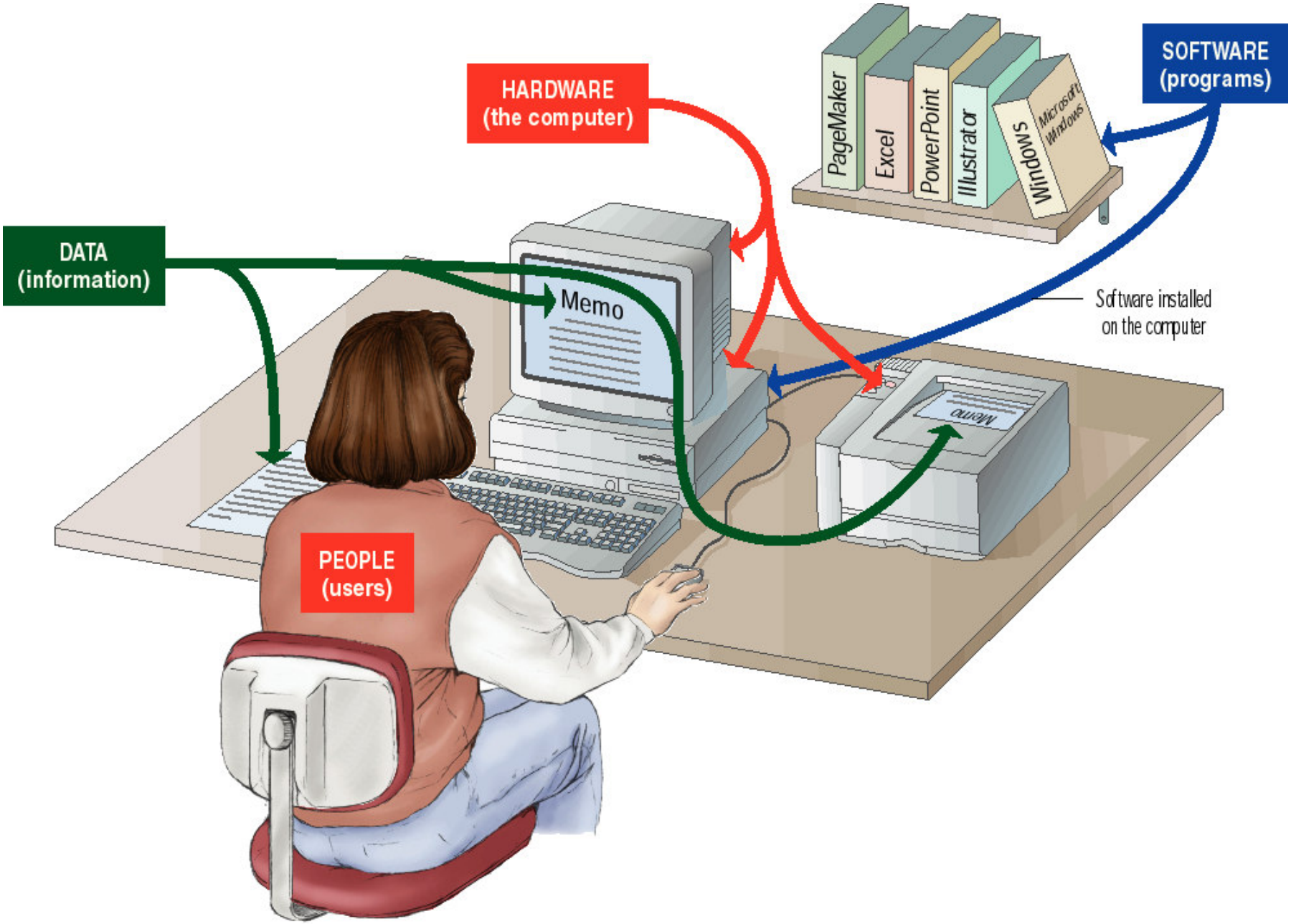
An Overview of the Computer System

The Parts of a Computer System

- What is a Computer?
- Hardware
- Software
- Data
- Users

The Parts of a Computer System - What is a Computer?

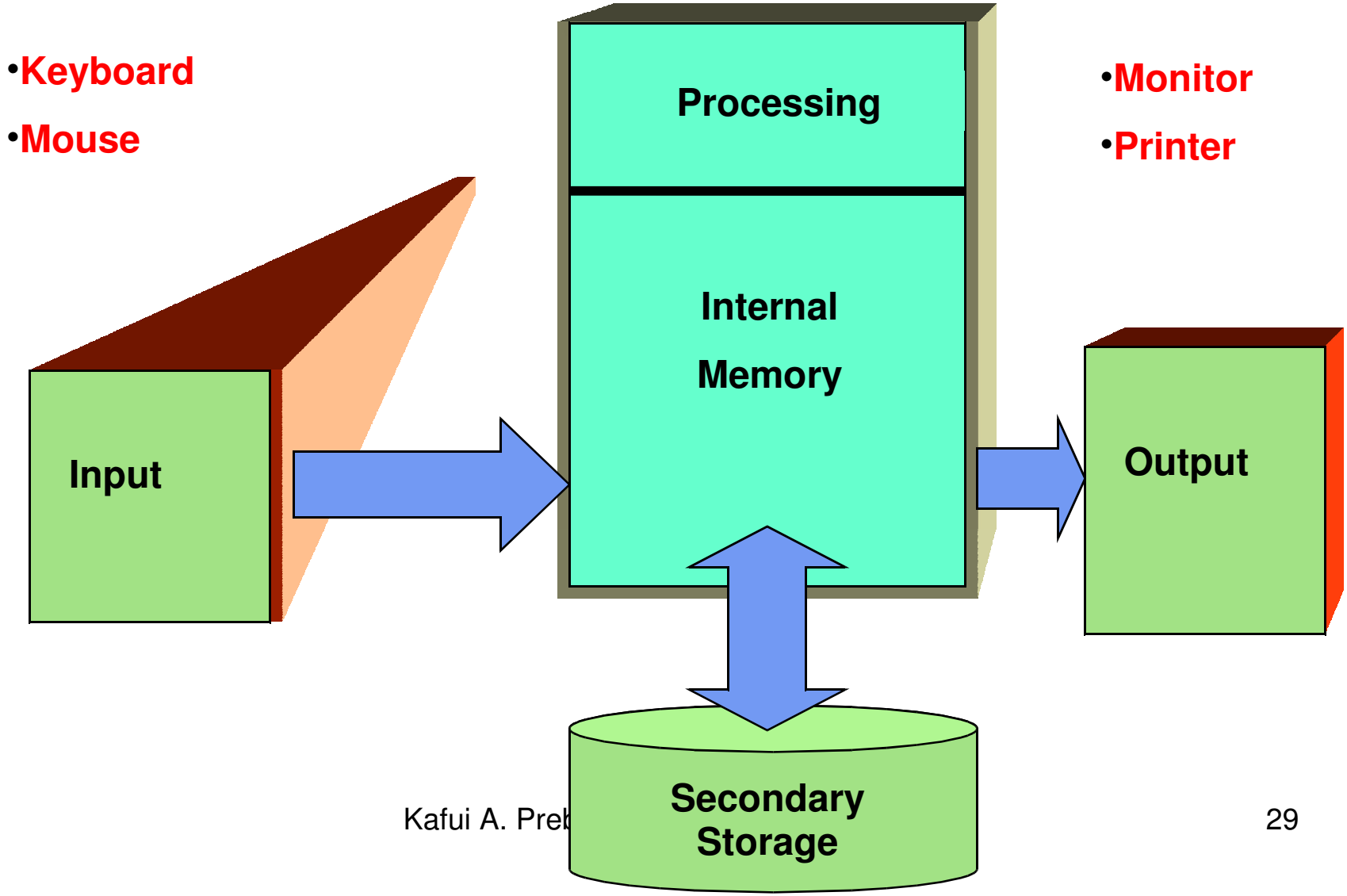
- A computer is an electronic device used to process data.
- A computer can convert data into information that is useful to people.
- A complete computer system includes four distinct parts:
  - **Hardware; Software; Data; User**


HARDWARE
(the computer)
SOFTWARE
(programs)
PageMaker
Excel
PowerPoint
Illustrator
Windows
DATA
(information)
Memo
Software installed
on the computer
PEOPLE
(users)

The Parts of a Computer System - Hardware

- A computer's hardware consists of electronic devices; the parts you can see and touch.
- The term "device" refers to any piece of hardware used by the computer, such as a keyboard, monitor, modem, mouse, etc.

Computer Hardware



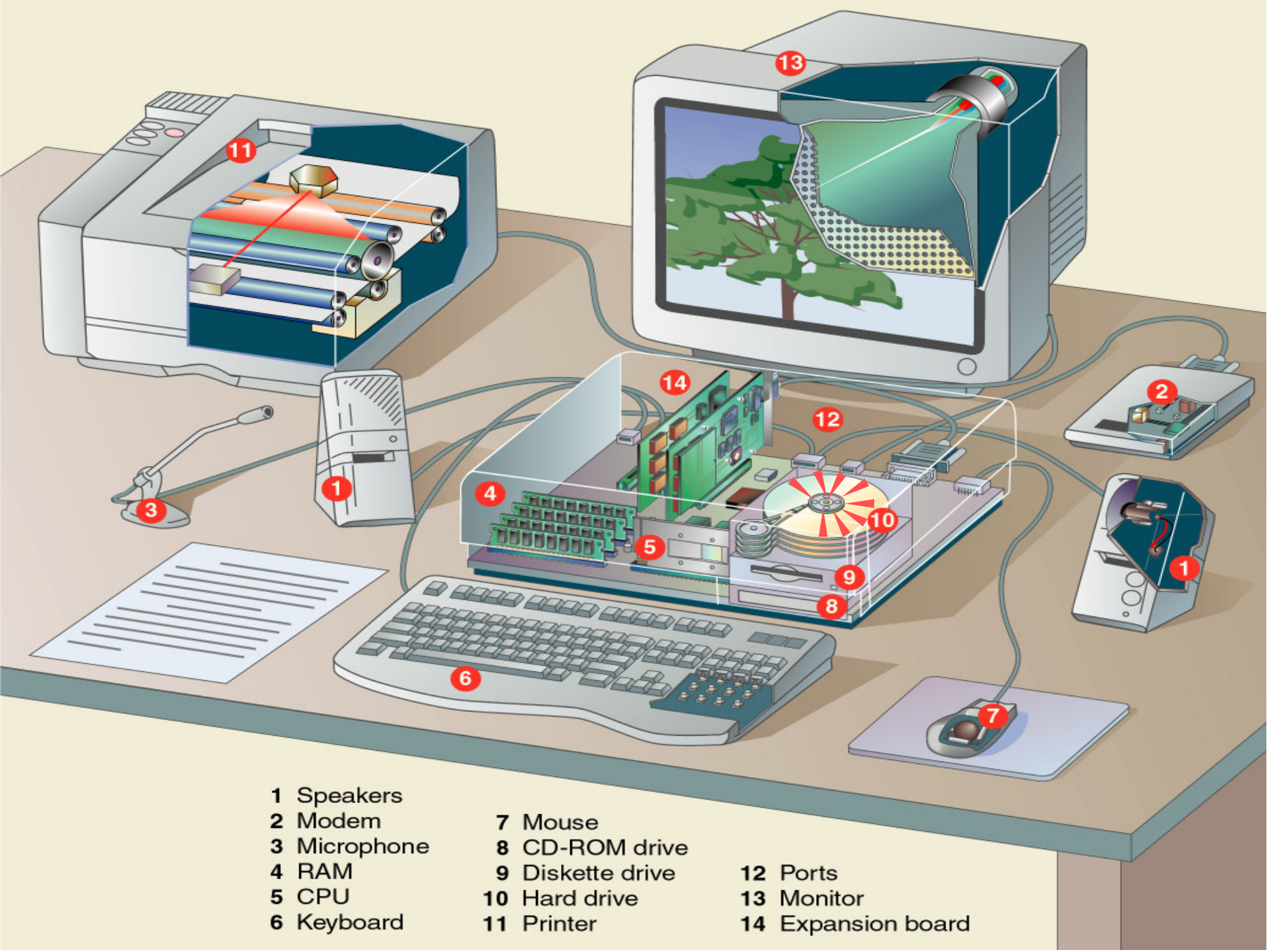
Looking Inside the Machine – Input and Output Devices

- **Input devices accept data and instructions from the user or from another computer system. The keyboard and mouse are examples of input devices.**

- **Output devices return processed data back to the user or to another computer system. The printer and monitor are examples.**

- **Communications devices (such as modems and network interface cards) perform both input and output, allowing computers to share information.**


IBM
Aptiva
IBM

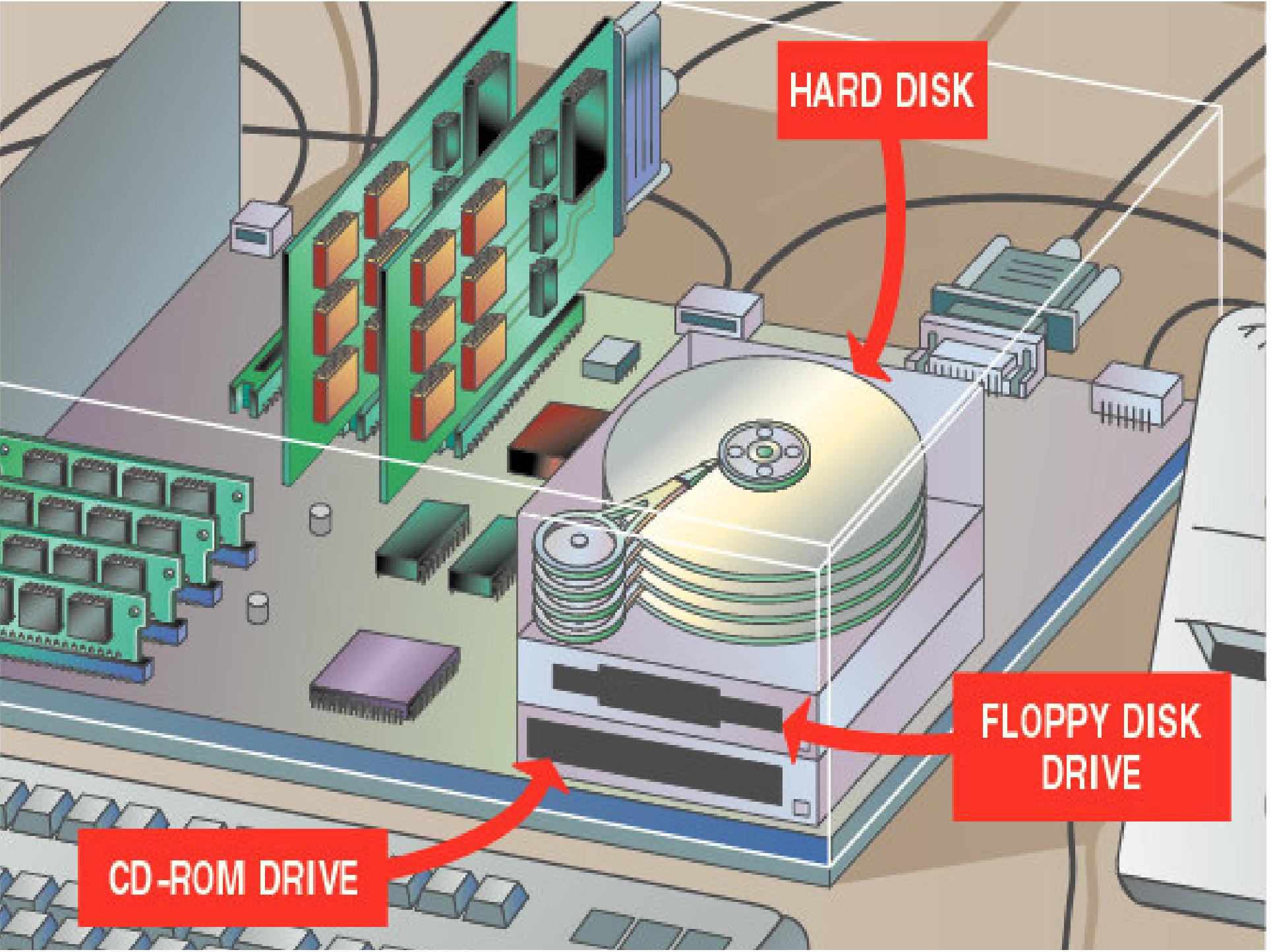

1 Speakers
2 Modem
3 Microphone
4 RAM
5 CPU
6 Keyboard
7 Mouse
8 CD-ROM drive
9 Diskette drive
10 Hard drive
11 Printer
12 Ports
13 Monitor
14 Expansion board

Looking Inside the Machine
- Storage Devices

- **Storage devices hold data not currently being used by the CPU. Data is commonly stored on a magnetic or optical disk. Each type uses a special medium for storing data on its surface.**

- **A disk drive is a device that reads data from and writes data to a disk. Most new computers feature a floppy disk drive, a hard disk drive, and an optical disk drive.**

- **The most common optical storage devices are CD-ROM and DVD-ROM drives.**


HARD DISK
FLOPPY DISK DRIVE
CD-ROM DRIVE

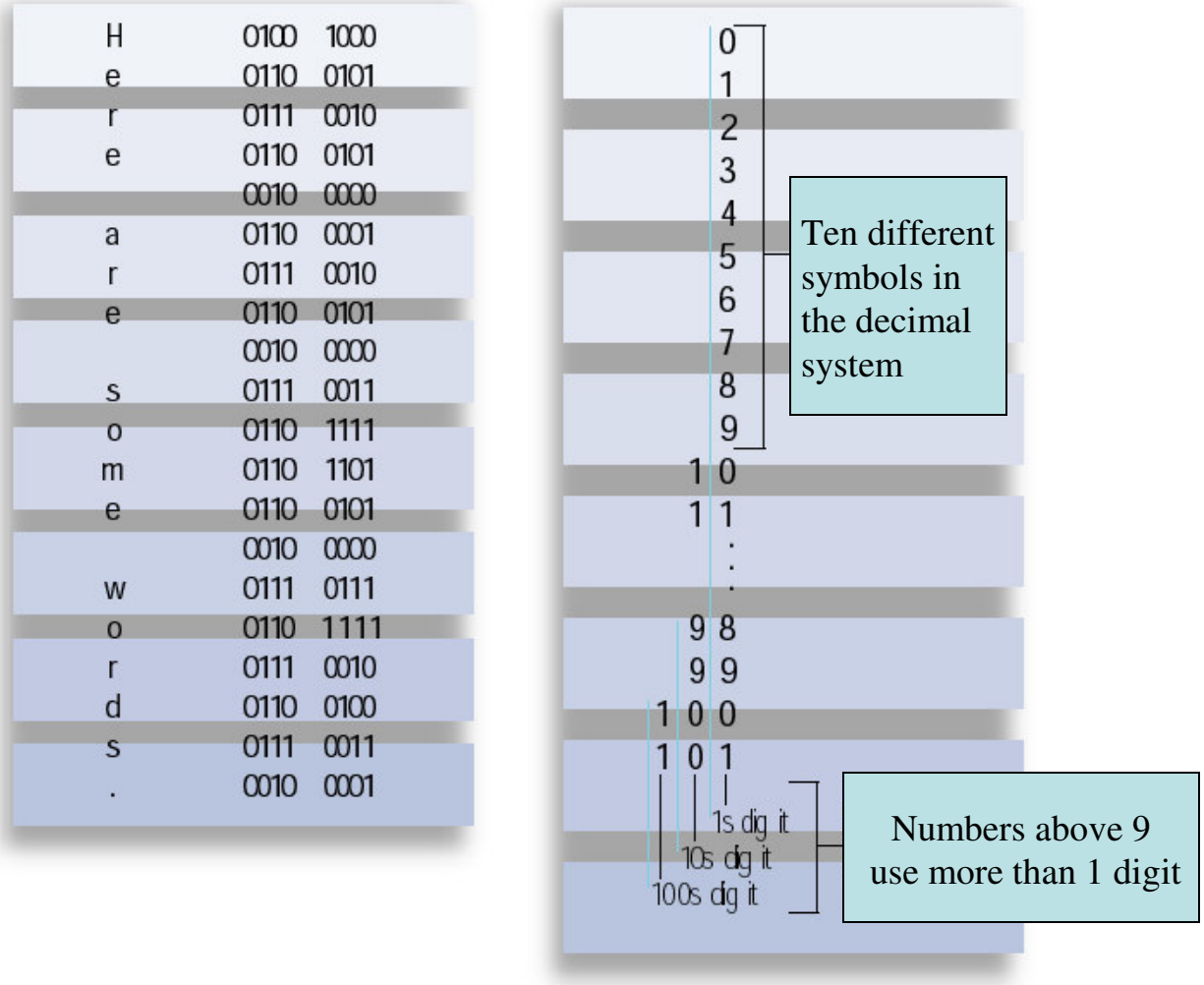
The Parts of a Computer System

- Software

- Software – also called programs – consists of organized sets of instructions for controlling the computer.
- Some programs exist for the computer's use, to help it manage its own tasks and devices.
- Other programs exist for the user, and enable the computer to perform tasks for you, such as creating documents.

The Parts of a Computer System - Data

- **Data consists of raw facts, which the computer can manipulate and process into information that is useful to people.**
- **Computerized data is digital, meaning that it has been reduced to digits, or numbers. The computer stores and reads all data as numbers.**
- **Although computers use data in digital form, they convert data into forms that people can understand, such as text, numerals, sounds, and images.**


H 0100 1000
e 0110 0101
r 0111 0010
e 0110 0101
0010 0000
a 0110 0001
r 0111 0010
e 0110 0101
0010 0000
s 0111 0011
o 0110 1111
m 0110 1101
e 0110 0101
0010 0000
w 0111 0111
o 0110 1111
r 0111 0010
d 0110 0100
s 0111 0011
. 0010 0001
0
1
2
3
4
5
6
7
8
9
Ten different symbols in the decimal system
10
11
98
99
100
101
1s dig it
10s dig it
100s dig it
Numbers above 9 use more than 1 digit

The Parts of a Computer System – Users

- People are the computer's operators, or users.
- Some types of computers can operate without much intervention from people, but personal computers are designed specifically for use by people.

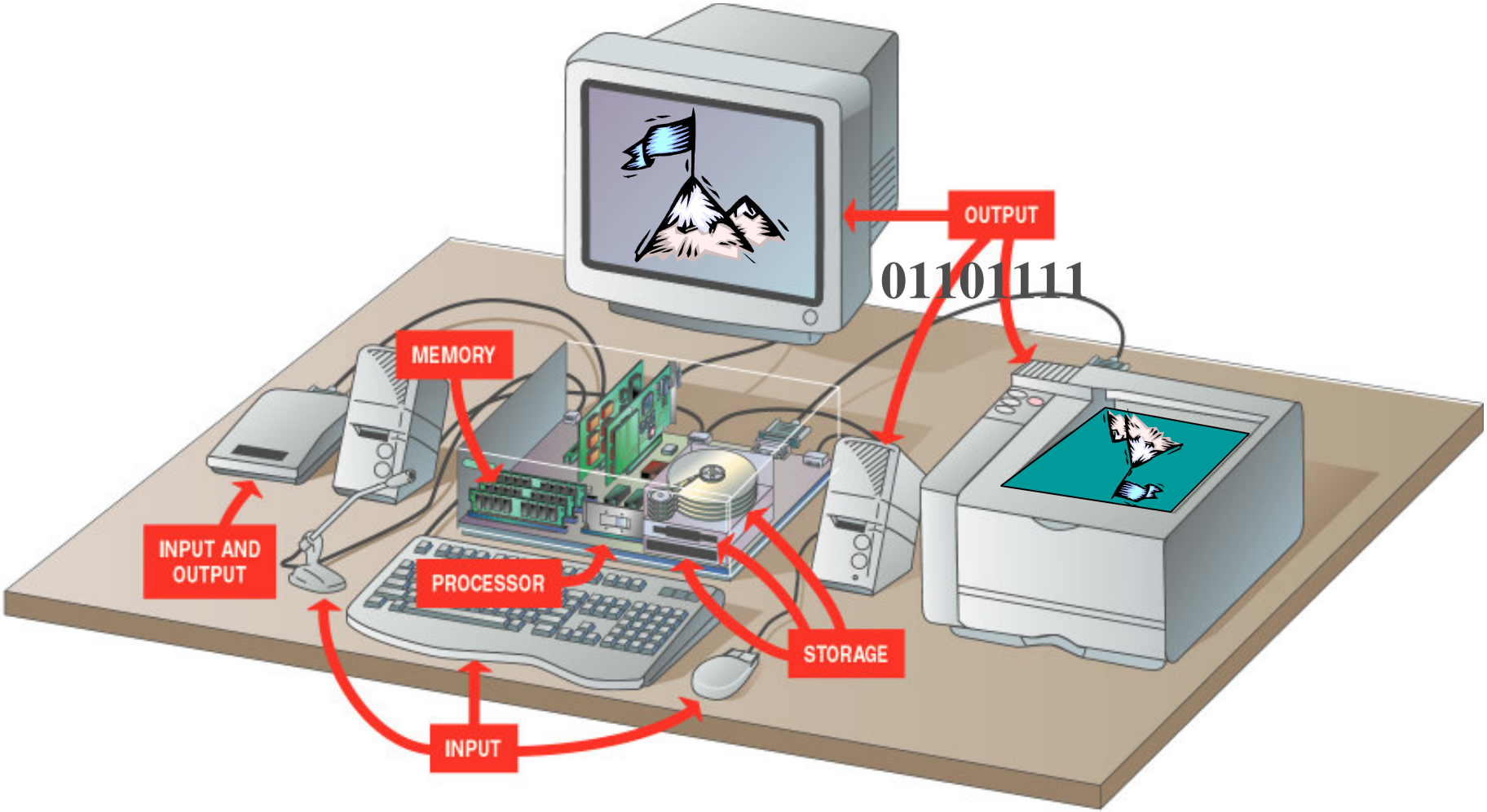
Looking Inside the Machine

- Types of Hardware
- The CPU
- Memory
- How Memory is Measured
- Input and Output Devices
- Storage Devices

Looking Inside the Machine – Types of Hardware

A computer's hardware devices are categorized as follows:

- **Processor**
- **Memory**
- **Input and output (I/O) devices**
- **Storage devices**


OUTPUT
01101111
MEMORY
INPUT AND
OUTPUT
PROCESSOR
STORAGE
INPUT

Looking Inside the Machine - The CPU

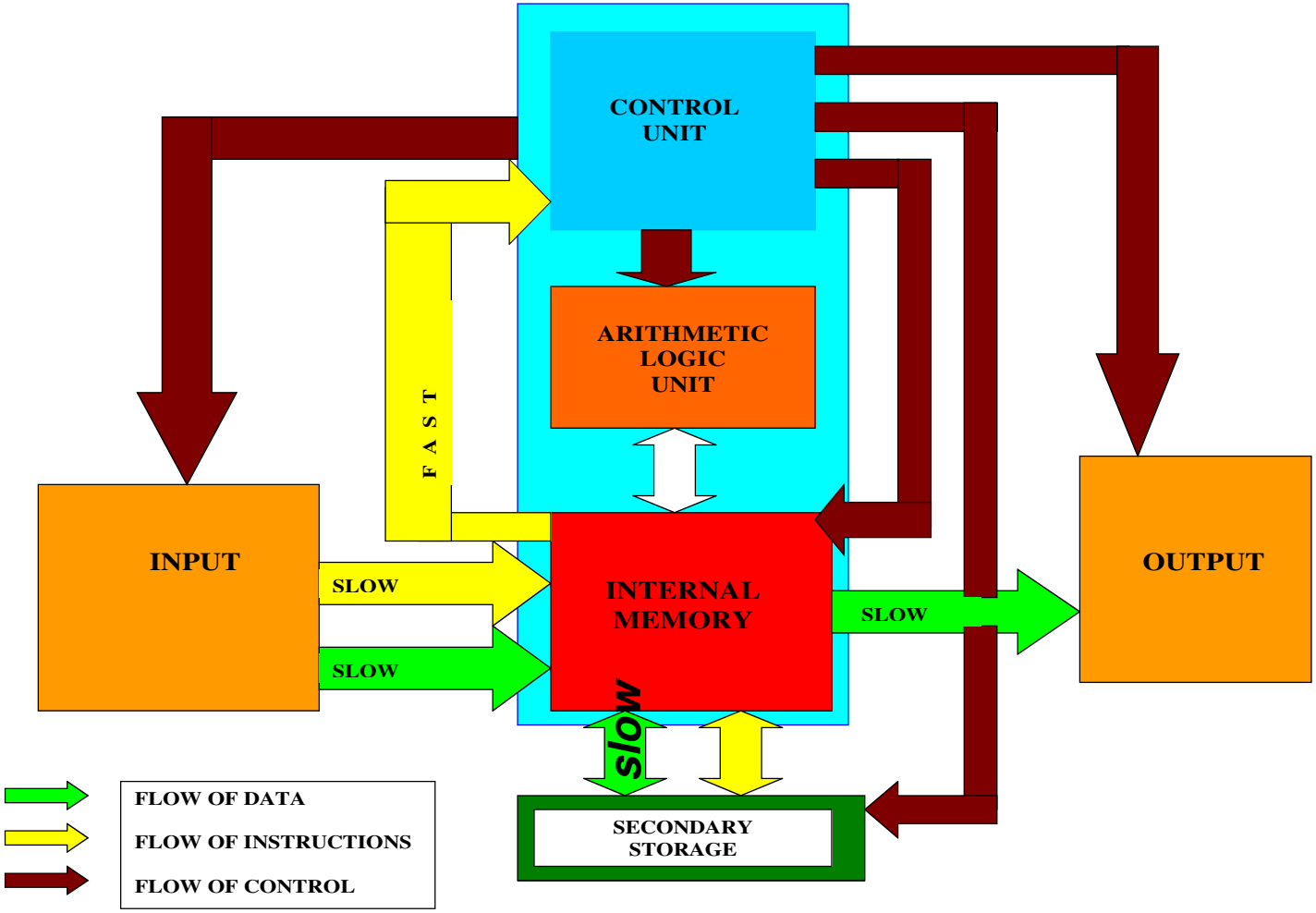
The procedure that transforms raw data into useful information is called processing. This function is divided between the computer's processor and memory.

Looking Inside the Machine - The CPU

- The processor is also called the central processing unit (CPU). It manages all devices and performs the actual processing of data.

The CPU consists of one or more chips attached to the computer's main circuit board (the motherboard).

Central Processing Unit



Central Processing Unit (CPU)

- The Central Processing Unit is the brain of the computer
- It is made up of the **Control Unit** (directs all operations), The **Arithmetic-Logic Unit** (carries out actual manipulations), and the **Internal Memory**
- All three parts are stored on an electronic device called **microchip** or simply the **chip.**
- Elements of the chip are **transistors** connected together in circuits called **Integrated Circuits.**
- **Registers** are high speed memory devices located in the ALU to hold data

Internal Memory

- Also known as **Main memory.**
- List of instructions to be executed (programs) and data are stored here.
- Two primary types of internal memory are **The Random Access Memory (RAM)** and **The Read Only Memories (ROM).**
- Data is stored in binary representations with permanent series of **electronic switches**, and miniature transistors called "**flip-flops".**

Read Only Memory (ROM)

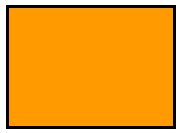
- **Read Only Memory is Non Volatile or permanent.**
- **User cannot store information on the ROM.**
- **Rom contains the Bootstrap information that the computer needs to start after the system disk is inserted.**
- **Some computers (Macintosh) have instructions for graphics and mouse stored on the ROM.**
- **Instructions of the ROM are referred to as Firmware.**
- **Information is stored by permanent switches**

Random Access Memory (RAM)

- Random Access Memory is **Volatile** (not permanent, items in RAM are lost when computer s turned off).
- User uses RAM to store information.
- Information is stored ion RAM by non permanent transistors called "**flip-flops**".
- Storage locations are identified by their address (in binary).
- RAM of a computer is discussed in terms of **Kilobytes and megabytes**.

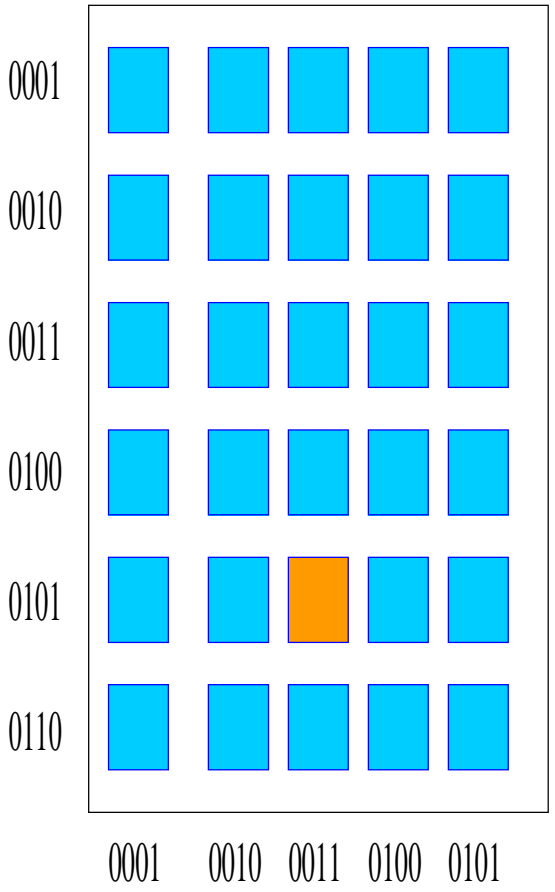
RAM (Address Locations)

- **Storage locations are referenced by address.**
- **Memory is measured by bytes**
- **1024 bytes = 1 Kb (kilobyte)**
- **1024 Kbytes = 1 Mb (megabyte)**
- **1024 Mb = 1 Gb (gigabyte)**



Memory **Address**

01010011



Looking Inside the Machine - Memory

- Memory also consists of chips attached to the motherboard.
- Memory holds data and program instructions as the CPU works with them. This memory is called Random Access Memory (RAM).
- The CPU can find any piece of data in RAM, when it needs it for processing.
- RAM is volatile, meaning it holds data only when the power is on. When the power is off, RAM's contents are lost.

Other Types of Memory

- **PROM** – Programmable ROM. This kind allows the user to program initial instructions (**"burn in"** the chips special instructions).

- **EPROM** – Erasable Programmable Read Only Memory.
- **Bubble Memory** is used in RAM to avoid volatility.
- **Use of Batteries** to power RAM in case of power failures

Internal Representation of Data and Instructions

- Computers use the **Binary Number System (base 2)** to represent data (characters and digits).

Decimal	Binary	Decimal	Binary
0	0	6	110
1	1	7	111
2	10	8	1000
3	11	9	1001
4	100	10	1010
5	101		

Bits and Bytes

- The smallest usable unit of measure for memory is the byte – the amount of memory required to hold one character, like the letter A or the numeral 2.
- Basic Unit of Measure in a computer is the **Bit** (contraction of **Bi**nary and Digi**t**).
- A Bit represents a **switch** and can be in one of two states, **on** or **off**.
- A group of **8 Bits** is called a **Byte.**
- Computers combines bytes to represent large numbers (and symbols).
- **Number of bits** used by a computer depends on the type of computer.

Bits and Bytes (Symbols)

- Computers use a pattern of bits to represent symbols.
- **EBCDIC (Extended Binary Coded Decimal Interchange Code)** was developed by IBM and uses 8 bits to represent data

- **ASCII (American Standard Code for International Interchange)** also uses 8 bits for data representation. This has become a standard for personal computers.

Looking Inside the Machine – How Memory is Measured

Computers work with larger chunks of data, measured in multiple bytes, as shown below:

Unit	Approx. Value (bytes)	Actual Value (bytes)
Kilobyte (KB)	1,000	1,024
Megabyte (MB)	1,000,000	1,048,576
Gigabyte (GB)	1,000,000,000	1,073,741,824
Terabyte (TB)	1,000,000,000,000	1,099,511,627,776

Secondary Storage

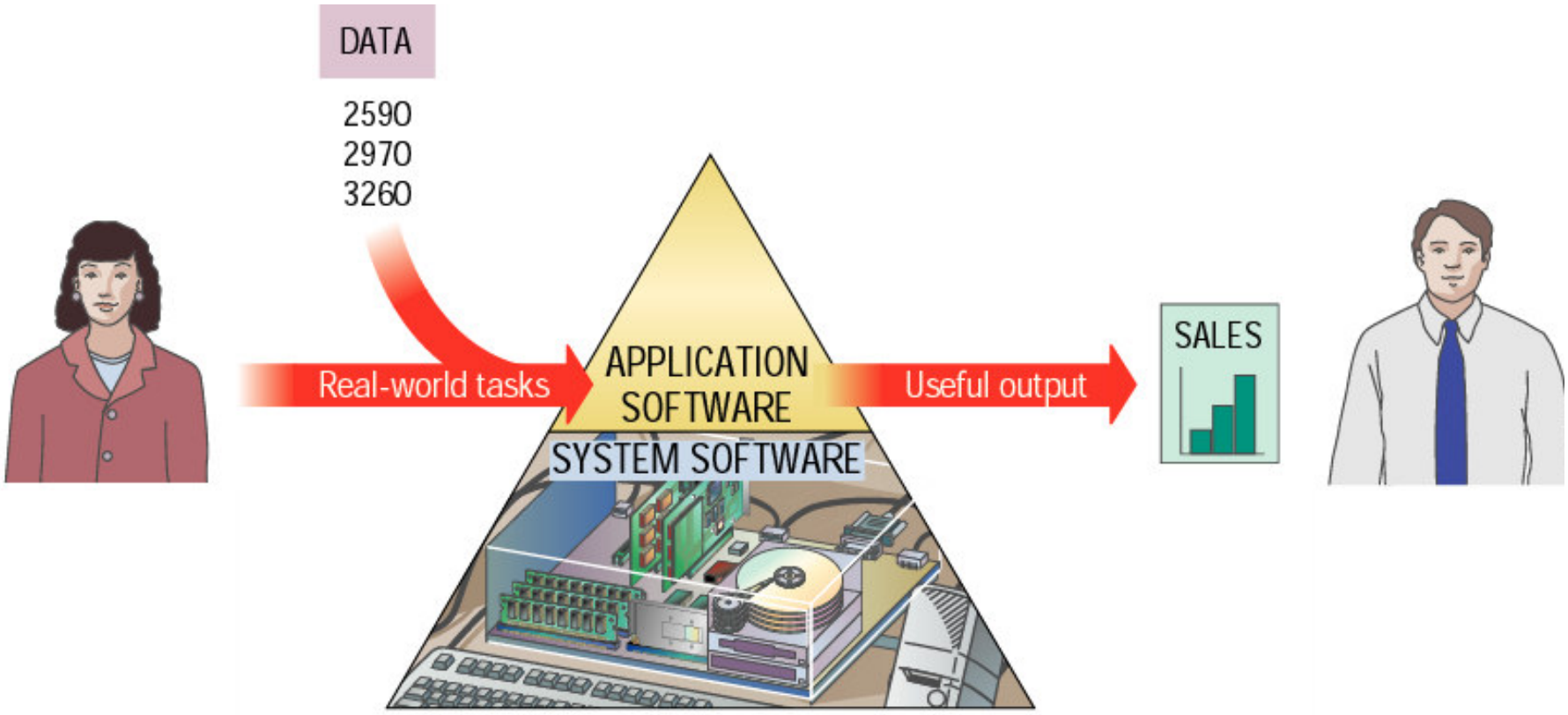
- **Secondary storage** is memory outside the CPU and Internal memory.
- **Secondary storage is needed** because of limited amount of memory and volatility of RAM.
- Secondary storage comes either as **disk** or **tape**

Software: Bringing the Machine to Life

- **What is Software?**
- **System Software**
- **Application Software**

Bringing the Machine to Life – What is Software?

- Software is a set of electronic instructions that tells the computer how to do certain tasks. A set of instructions is often called a program.
- When a computer is using a particular program, it is said to be running or executing the program.
- The two most common types of programs are system software and application software.


DATA
2590
2970
3260
Real-world tasks
APPLICATION SOFTWARE
SYSTEM SOFTWARE
Useful output
SALES

Bringing the Machine to Life – System Software

- System software exists primarily for the computer itself, to help the computer perform specific functions.
- One major type of system software is the operating system (OS). All computers require an operating system.
- The OS tells the computer how to interact with the user and its own devices.
- Common operating systems include Windows, the Macintosh OS, OS/2, and UNIX .

Bringing the Machine to Life - Applications

- **Application software tells the computer how to accomplish tasks the user requires, such as creating a document or editing a graphic image.**
- **Some important kinds of application software are:**

Word processing programs
Database management
Graphics programs
Web design tools and browsers
Communications programs
Entertainment and education

Spreadsheet software
Presentation programs
Networking software
Internet applications
Utilities
Multimedia authoring

lesson 2 review

- List the four parts of a computer system.
- Identify four types of computer hardware.
- List five units of measure for computer memory and storage.
- Provide two examples of input and output devices.
- Name and describe three types of storage devices.
- Differentiate the two main categories of computer software.
- List four specific types of application software.